

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

D. Remarks

Rejection of Claims 8, 9, 12 and 13 Under 35 U.S.C. §103(a), based on U.S. Patent No. 4,679,304 (*Bois*) in view of Japanese Patent Publication 62-216268 (A) (*Goto*) and further in  
5 view of U.S. Patent No. 5,731,221 (*Kwon*).

The invention of claim 8 is directed to a manufacturing method of a semiconductor device. The method includes etching the stacked film and the first oxide film to form a plurality of stacked film patterns and oxidizing the semiconductor substrate to form a second oxide film on a surface of the semiconductor substrate sandwiched between adjacent said stacked film  
10 patterns. The second oxide film has a film thickness thicker than the first oxide film. The method further includes forming a side wall mask film on a side of the stacked film patterns and removing the portion of the second oxide film sandwiched between the mask patterns to form a trench. The trench is filled with an insulating film.

As is well known, to establish a prima facie case of obviousness, a rejection must meet  
15 three basic criteria. First, there must be some suggestion or motivation to modify a reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference(s) must teach or suggest all claim limitations. Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found in  
20 either the references themselves or in the knowledge generally available to one of ordinary skill in the art.

Applicant traverses this rejection based on a number of arguments, set forth in separate sections below.

25 *Goto* teaches away from Applicant's Invention.

To show the limitations of Applicant's claim 8 limitations, the rejection modifies *Bois* in view of *Goto*.

It would have been within the scope of one of ordinary skill in the art to combine  
30 the teachings of *Bois* and Japan '268 to enable formation of the LOCOS mask of

Bois.<sup>1</sup>

Japan '268 discloses the formation of a mask that is disclosed to be suitable in LOCOS processes such as is performed in the process of Bois.<sup>2</sup>

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Applicant respectfully disagrees. As is well established, prior art references must be read as a whole and consideration must be given where the references diverge and teach away from the claimed invention.<sup>3</sup> *Goto* (i.e., Japan '268) does not show a mask suitable for LOCOS processes.

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The portion of *Goto* relied upon by the rejection (FIG. 1) does not show a mask like that of *Bois*. In fact, *Goto* teaches away from *Bois* by clearly stating that mask approaches like that of *Bois* are undesirable due to necessary mask alignment allowances. The following citation as evidence showing *Goto* explicitly teaches away from combination with *Bois*.

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To eliminate the need for providing allowance for mask alignment...<sup>4</sup>

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FIG. 1 of *Goto* does not teach a conventional mask, but rather an arrangement in which a conventional mask (i.e., a mask like that of *Bois*) is eliminated by utilizing gate electrodes instead of a mask. More particularly, when *Goto* is read as a whole, the differences between FIGS. 1 and 2 makes this clear. FIG. 2 of *Goto* shows a conventional mask approach like that of *Bois*. In FIG. 2, a mask is formed (FIG. 2(a)). Isolation regions are formed (FIG. 2(b)). The mask is then removed (FIG. 2(c)). A polysilicon film is formed afterward (FIG. 2(c)-2(d)). This approach is essentially the same as *Bois*. *Bois* forms a mask (FIG. 1). An isolation region is formed (FIG. 2). The mask is then removed (FIG. 5). Both of these approaches require some allowance for mask alignment with a subsequently formed gate, because any gate is formed after the mask is removed. Said in another way, both *Bois* and FIG. 2 of *Goto* teach a removed isolation mask which necessarily requires allowance for mask alignment.

*Goto* explicitly teaches away from removed isolation masks. As noted above, *Goto* seeks

<sup>1</sup> See the Office Action, dated 4/24/03, Page 2, Lines 11-12.

<sup>2</sup> See the Office Action, dated 4/24/03, Page 3, Lines 2-3.

<sup>3</sup> *Azko N.V. v. United States Intl' Trade Comm'n*, 1 USPQ 2d 1241, 1246 (Fed. Cir. 1986).

<sup>4</sup> See *Goto*, PURPOSE section.

to avoid masks altogether by forming gates in conjunction with and not after an isolation mask – hence eliminating “the need for providing allowance for mask alignment” as explicitly stated in *Goto*.

In summary, one skilled in the art reviewing *Goto* would be discouraged from pursuing the removed isolation mask approach of *Bois*, and thus discouraged from forming a trench as set forth in Applicant’s claim 8. As is well established,

[A] reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.<sup>5</sup>

Thus, *Goto* is believed to teach away from combination with *Bois*, and hence Applicant’s trench forming limitations. As is well settled, a prima facie case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention.<sup>6</sup> Because *Goto* teaches away from Applicant’s claim 8 invention, any prima facie case of obviousness is rebutted by Applicant’s above showing.

For the same essential reasons, one reading *Goto* would be discouraged from pursuing combination with *Kwon*, as relied upon in the rejection, as *Kwon* appears no different than *Bois*. Like *Bois*, *Kwon* teaches a removed isolation mask. In *Kwon*, a mask is formed (FIG. 1A). Isolation regions are formed (FIG. 1A). The mask is then removed (FIG. 1E). Again, *Goto* explicitly teaches away from such approaches due to the need for providing allowance for mask alignment.

Thus, *Goto* is believed to teach away from combination with *Kwon*, and hence Applicant’s trench forming limitations.

For this reason, this ground for rejection is traversed.

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<sup>5</sup> In re Gurley, 31 USPQ 2d 1130, 1131 (Fed. Cir. 1994).

<sup>6</sup> In re Geisler, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997).

The combination of *Bois* in view of *Goto* changes the principle operation of *Bois*.

In addition or alternatively, Applicant maintains that there is no motivation to combine the *Bois* in view of *Goto*. As indicated above, a prima facie case of requires motivation for a proposed combination relied upon in the rejection. At the same time, if a proposed modification or combination would change the principle operation of the prior art invention being modified, the teachings of the references are not sufficient to render the claims prima facie obvious.<sup>7</sup>

The proposed combination of substituting gates structures of *Goto* with the nitride mask of *Bois* changes the principle operation of *Bois*. As noted above, *Bois* teaches a removed isolation mask. Substituting the structure of *Goto*, as argued, would change the operation of *Bois* from a removed isolation mask (a mask which is stripped of the device entirely) to a gate electrode (a device which is retained and serves as an active element in a semiconductor device). Thus, such a change is believed to be a change in the principle operation of the device.

For this additional reason, this ground of rejection is traversed.

Claim 13 recites that a stacked film can include a stopper film that provides a stopper for a chemical mechanical polishing step. The ground for rejecting this claim is set forth below.

Applicant argues that claim 13 has not been addressed. In response, any of the film layers of the stacked film could perform the recited function of providing a stopper for a CMP step.<sup>8</sup>

This rationale represents (1) a new ground of rejection and (2) is not sufficient to establish a prima facie case of obviousness.

No grounds of rejection were provided for claim 13 in the first Office Action on the merits. Thus, this rejection of claim 13 represents a first time final rejection, denying Applicant a fair opportunity to meet the rejection with evidence and argument. Accordingly, Applicant requests reconsideration on this matter to establish right of petition. The request for reconsideration is included herewith.

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<sup>7</sup> In re Ratti, 123 USPQ 349 (CCPA 1959).

<sup>8</sup> See the Office Action, dated 4/24/03, Page 3, Lines 18-19.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

The above rejection is per se insufficient for a prima face case of obviousness. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.<sup>9</sup> The rationale for rejecting claim 13 is a conclusion, not supported by any reference or other reason (e.g., reliance  
5 on official notice).

Accordingly, a prima facie case of obviousness cannot have been established for this claim.

For all of these reasons, the rejection of claims 8, 9, 12 and 13, is traversed.

10 Rejection of Claim 10 Under 35 U.S.C. §103(a), based on *Bois* in view of *Goto*, further in view of *Kwon*, and further in view of U.S. Patent No. 5,106,772(*Lai*)

To the extent that this ground of rejection relies on *Bois* in view of *Goto*, further in view of *Kwon*, Applicant incorporates by reference herein the comments set forth above for claim 8.

In addition, Applicant adds that the motivation necessary for such a combination is  
15 lacking in the rejection.

The rationale for modifying *Bois*, *Goto* and *Kwon* further with *Lai*, is set forth below.

It would have been within the scope of one of ordinary skill in the art to combine the teachings of the combination and those of *Lai* to enable EEPROM formation.  
20 However, art recognized suitability for an intended purpose has been recognized as motivation to combine MPEP 2144.07. The process of the combination teaches formation of layers corresponding to a gate oxide and floating gate according to the teachings of *Lai*. The formation of the control gate on such a structure is disclosed by *Lai*.<sup>10</sup>

25 Applicant believes the prior art clearly teaches away from combining *Bois* with *Lai*, for the same essentially reasons that a combination of *Goto* with *Bois* cannot be obvious. Namely, that *Bois* teaches isolation masks that are removed, and *Lai* teaches EEPROM gates, which are retained.

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<sup>9</sup> In re Mills, 16 USPQ2d 1430 (Fed. Cir. 1990)

<sup>10</sup> See the Office Action, dated 4/24/03, Page 4, Lines 8-12.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Rejection of Claim 11 Under 35 U.S.C. §103(a), based on *Bois* in view of *Goto*, further in view of *Kwon*, even further in view of U.S. Patent Application Publication US 2001/0011759 (*Rho et al.*) or U.S. Patent No. 5,693,542 (*Suh et al.*).

To the extent that this ground of rejection relies on *Bois* in view of *Goto*, further in view of *Kwon*, Applicant incorporates by reference herein the comments set forth above for claim 8.

In addition, Applicant again notes that references must be considered as a whole. When reviewed in its entirety, *Rho et al.* teaches away from combination with *Bois*. *Bois* teaches an isolation film with tapering oxide wedges (i.e., “bird’s beak”) on the side.<sup>11</sup> *Rho et al.* explicitly seeks the removal of such features.

[I]t is very important to obtain the correct active area, therefore the shallow trench isolation (STI) technique capable of removing the bird’s beak is highlighted.<sup>12</sup>

That is, the reference *Bois* retains a feature that *Rho et al.* seeks remove. Thus, the above reference teaches away from combination with *Bois*, and hence away from Applicant’s limitations of removing a portion of second oxide film.

The other reference relied upon, *Suh et al.* is not related to isolation. *Suh et al.* is directed to forming a trench filled with a conductive material for a transistor. The trench improves the punchthrough features of the transistor. It is not an isolation trench.<sup>13</sup>

Thus, it is not understood why one would look to transistor punchthrough resistance teachings to modify isolation trenches. Thus, there are no teachings providing a suggestion/motivation for combining *Suh et al.* with the remaining references, hence no prima facie case of obviousness.

Rejection of Claims 14 and 15 Under 35 U.S.C. §102(b) based on *Bois*.

The only basis for rejecting these claims is set forth below.

Claims 14 and 15 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by *Bois*.<sup>14</sup>

<sup>11</sup> See *Bois*, FIGS. 2-5, which show tapered portions of SiO<sub>2</sub>.

<sup>12</sup> See *Rho et al.*, paragraph [0005].

<sup>13</sup> See *Suh et al.*, Col. 3, Lines 17-22. Note that the trench is filled with polysilicon layer 106’.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant argues that no reasons or grounds for motivation have been provided. In response applicant is directed to the statement “Claims 14 and 15 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Bois”. No explanation is  
5 necessary because the entire patent is directed to the claimed subject matter including the abstract and figures. In the interest of compact prosecution applicant is directed to the statements regarding the reference above.<sup>15</sup>

Applicant emphasizes that these are the only grounds of rejection.

10 Applicant can only note that this rejection is incomplete. Incomplete rejections are best summarized in In re Oetiker:

The examiner cannot sit mum, leaving the applicant to shoot arrows in the dark hoping to somehow hit a secret objection harbored by the examiner. The “prima  
15 facie” case notion... seemingly was intended to leave no doubt among examiners that they must state clearly and specifically any objections (the prima facie case) to patentability, and give the applicant a fair opportunity to meet those objections with evidence and argument.<sup>16</sup>

20 Without a clear indication of which features are shown where in *Bois*, Applicant is left to guess about the exact grounds of rejection.

Applicant also emphasizes that in rejecting claim 8, the Examiner has admitted that limitations of claims 14 and 15 are not shown in Bois.

25 Applicant will present no rebuttal argument, as the above rationale is not sufficient to sustain a rejection.

Rejection of Claims 16-20 Under 35 U.S.C. §103(a) based on Bois in view of Lai.

The rejection has not established a prima facie case of obviousness for these claims as numerous limitations have not been shown or suggested. Selected of these limitations will be

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<sup>14</sup> See the Office Action, dated 11/1/02, Page 4, Line 12.

<sup>15</sup> See the Office Action, dated 4/24/03, Page 5, Lines 11-15.

<sup>16</sup> In re Oetiker, 24 USPQ 2d 1443, 1447 (Fed. Cir. 1992) (Plager, J. concurring).

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

listed below.

Claim 16: removing the stacked film pattern and forming a gate oxide film

Claim 17: first electrode end portions higher than a central portion

Claim 18: first insulating film even with a top surface of the electrode

Because these limitations are never mentioned in the rejection, a prima facie case of obviousness cannot exist for these claims.

The present claims 1-20 are believed to be in allowable form. It is respectfully requested that the application be forwarded for allowance and issue.

Respectfully Submitted,

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